

ART. VIII.—*A Suggested Nomenclature for the Marine Tertiary Deposits of Southern Australia.*

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The confusion that has existed and still exists as to the age of the various members of the Tertiary series of Southern Australia makes it impossible for anyone who is not familiar with the history of the subject to understand what beds are referred to when the terms Eocene, Miocene, or Pliocene are used. It will probably be long before complete unanimity exists among workers in various parts of the globe as to the ages to which our subdivisions are to be referred, and meanwhile fossils are being described and recorded as Eocene or Miocene and the confusion is rapidly becoming worse. Moreover, with the progress of time the ideas of authors as to the age of certain beds change and their Eocene of to-day is not their Eocene of say ten years ago.

One familiar with even the outlines alone of our Tertiary Geology has only to glance at the brief notices which modern English text books give of our Cainozoic series to see confusion in the minds of geologists elsewhere. The fault lies at our own door and we should amend our ways and not pillory those who cannot understand us. We ourselves know without any difficulty what Duncan meant when he said "Miocene" and what M'Coy meant by Oligocene. We know what beds Professor Tate, Mr. Dennant and ourselves mean by these terms, but it is surely too much to ask anyone to so familiarize himself with the kaleidoscopic changes of our Tertiary controversy that he has to recollect the date of the paper he is reading and the particular views of the author at that date in order to remember the fauna associated with a newly described fossil.

Perhaps two examples will show the condition into which we have drifted and the urgent need of reform. There is a short section exposed near the hamlet of Beaumaris on the shores of Port Phillip Bay which, before closer settlement had filled in our

maps with locality names, was referred to as the Mordialloc, Cheltenham or Brighton beds. The age to which the beds are to be referred is the subject of very diverse views, as the following statement will show.

They were referred to:—

Older Pliocene	-	by McCoy	-	-	-	1875
Miocene	-	by Hall and Pritchard	-	-	-	1897
Miocene (?)	-	by Tate	-	-	-	1888
Oligocene (?)	-	by Tate	-	-	-	1899
Eocene	-	by Tate and Dennant	-	-	-	1893
Eocene	-	by Pritchard	-	-	-	1892

Similarly a series of beds at Spring Creek, south of Geelong, was held by McCoy to range from Upper Miocene to Oligocene. Messrs. Tate and Dennant at one time considered the whole series Eocene, but at a later date Professor Tate referred it to Oligocene, while we are of opinion that the series as a whole is older than the Mornington series called Eocene by Messrs. Tate and Dennant as well as by ourselves.

Correlation of Australian strata with those of the Old World and with America is a task of great importance, and problems of interest connected with the place of origin of certain forms of life can only be solved when this task shall have been fulfilled. Hitherto the question of correlation has not received very detailed investigation at the hands of geologists of the northern hemisphere, for the question is one of extreme difficulty. The conclusions of Australian geologists have been provisionally accepted with a more or less open expression of doubt. But the time for this is passing away and we shall no longer be allowed to settle the question alone as best we can. American geologists are turning their attention to the Patagonian Tertiaries, which they assert have, as we should expect, an undoubted close relationship to ours. By the time scale they deduce they will judge the age of the mammalian fauna there, and as far as has yet been announced they will refer the marine beds to a younger age than we do. Probably if this be so we shall not give way without a struggle, but, with our present nomenclature, we must use terms which imply the acceptance of a theory. As a great amount of work for many years to come will be concerned with

the local correlation of our beds and the elaboration of our subdivisions it seems to us advisable to employ local names for the main subdivisions of our strata. This plan is of world-wide use, and by its adoption we should be making no retrograde step, but would be clearing the way for a detailed consideration of two problems, namely the correlations of our strata between themselves, and a correlation with strata elsewhere. If the main types have these names applied to them there will no longer be any need to say whose views one is following, as we need to now when speaking of certain beds as Eocene or Miocene. The important question as to the relative position of the different formations can be put on one side and need not be forced into consideration in every line of a paper dealing with some small local set of strata.

Recognising then the advisability of such a change, it remains to consider what are the principles which should actuate us in our choice. These seem to be few and simple. Firstly, any series of strata with a fauna differing appreciably in its constituents from others should receive a distinctive name. Secondly, the name should be taken from a locality where there is no chance of confusion between the contents of beds of distinct ages. Thirdly, we should not use names which are used in other parts of the world as names of formations. In the fourth place, it should be understood that the names given are given to a particular set of strata and are irrespective of the correctness or otherwise of the subsequent correlation of other beds with them.

Bearing these provisos in mind we may consider their application to our Tertiary strata and discuss the appropriateness of the following names which we suggest.

Werrickoian.

The Limestone Creek beds on the Glenelg River are in the Parish of Werricko, in the County of Follett. They have been referred to Pleistocene and to Pliocene. There is another Limestone Creek, near the head of the Murray, in Victoria, which yields Palaeozoic fossils, and a third in the County of Heytesbury, with Older Tertiary fossils.

Kalimnan.

The beds at Jimmy's Point, near the mouth of the Gippsland Lakes, are near the township of Kalimna. They were referred to Older Pliocene by Sir F. M'Coy, and by Mr. Dennant to Miocene. There are two other deposits in Victoria with rich faunas, which were considered Older Pliocene by M'Coy, namely, the Upper beds at Muddy Creek, near Hamilton, and the Beaumaris beds.

The former is called Miocene by Messrs. Tate and Dennant and ourselves, but, as it immediately overlies beds belonging to our older Tertiary series, a name received from this locality is unsuitable. The Beaumaris beds, again, are considered by ourselves to belong to the same series, but are quoted as older by Professor Tate, so that they are out of court.

Balcombian.

The clays and limestones of Balcombe's Bay contain another distinct fauna. The beds are sometimes spoken of as at Mornington, but the locality we give is more exact. The Lower Beds at Muddy Creek and the Orphanage Hill beds at Fyansford, near Geelong, are approximately equivalent to the Balcombe's Bay Beds, but the exact separation of the two sets of beds at Muddy Creek is not yet sufficiently clear, and a name from that locality would lead to confusion. The beds are called Eocene by Messrs. Tate and Dennant and ourselves. Sir F. M'Coy considered them Oligocene.

*Jan Jucian.*¹

The section near Spring Creek, on the coast of Bass Strait, south of Geelong, is in the main in the Parish of Jan Juc, and its fauna differs greatly from that of Balcombe's Bay. The confusion about the age of these beds has been referred to above. The township near Spring Creek is called Torquay, but the use of this name in England renders another advisable. The older name for Torquay was Puebla, but the employment of this name, again, would lead to confusion with certain American strata.

¹ The "c" is sounded like "k."

The name Jan Juc remains, and is referred to by M'Coy as the locality whence several of his fossils came.

Aldingan.

The term Aldingian has been used by Professor Tate in speaking of the section at Aldinga, but we should prefer the spelling we give. In the cliff sections, as described by Messrs. Tate and Dennant, "Miocene" overlies "Eocene," and the term Aldingian as used by them includes both sets of strata. If it be confined to the lower series only, it might perhaps be employed, though it violates the principle that a name should not be given from a locality where two distinct series are in contact. As we differ from the views of Messrs. Tate and Dennant on the question as to its equivalence or otherwise with the Spring Creek series, a type name may be thought advisable, for the present at any rate, though our own views are opposed to its use.

We should like once more to emphasise the point that the names we give are given in the first place to the beds displayed at the localities from which the names are derived, and we are thus able to fix a top and a bottom to each formation. There can be no doubt, except in our opinion in the case of Aldingan and Jan Jucian, of the distinctness of the faunas they typify.

CORRELATION.

We now come to consider the different sets of beds to be ranged under these names, for series of strata agreeing palaeontologically must be grouped with them. About some there is at present unanimity of opinion, but in other cases diverse views are held. These points we shall indicate as far as we can, though, owing to the fact that no very detailed lists of comparable localities have been published by Messrs. Tate and Dennant, it is possible that their views may not always be correctly represented. The list we give is practically that published by one of us (G. B. P.) in the Report of the Brisbane Meeting of the Australasian Association for the Advancement of Science in 1895.

Werrikooian.

Limestone Creek.

Kalimnan.

Jimmy's Point, Gippsland. Upper beds of the Murray River Cliffs. Upper beds at Aldinga. Upper beds at Muddy Creek. Upper beds at Shelford. With these we would associate the Marine Sands of the Dry Creek and Croydon bores, South Australia, which were regarded by Prof. Tate as intermediate in age between the Limestone Creek and the Jimmy's Point beds. To this series we also refer the Upper beds at Beaumaris, which were correlated by Professor Tate with the Spring Creek series, the latter being, in our opinion, older than Balcombian.

Balcombian.

Balcombe's Bay and Grice's Creek, Mornington. Lake Connewarre. Southern Moorabool Valley. Upper beds at Maude. Altona Bay. Gellibrand. Camperdown. Murgheboluc. Shelford, lower beds. Bairnsdale. Corio Bay. Curlewis. Belmont. Fishing Point, Aire River.

Jan Jucian.

Spring Creek. Table Cape, Tasmania. Waurm Ponds. With these we include the lower beds at Maude, which Professor Tate and Mr. Dennant considered to show much closer relationship to the lower beds of Muddy Creek. We also refer to the same series the lower (*i.e.* "Eocene") beds at Aldinga, the Aire Coastal series and the Cape Otway beds. In the association of the Aldinga, Aire Coastal and Cape Otway beds together we are apparently in agreement with the views of Messrs. Tate and Dennant, but, as will be seen on referring to the earliest parts of this paper, their association with the Spring Creek and Table Cape series is strongly opposed to the view of the same authors. But as has been already pointed out the correctness of all the details of this correlation is not a necessary preliminary to the use of the terms suggested. It is open to those who differ to separate any of the members, and, where possible, to group them similarly under other appropriate names.

There still remains a number of localities which we have not grouped with any of the formations. With regard to these we consider the published evidence or our own knowledge to be insufficient for the expression of a definite opinion.

THE SEQUENCE AND AGE.

As an addendum to the main part of this note we may as well consider the different views which have existed as to the sequence and age of the beds to which we have attached names.

	M'Coy.	Tate & Dennant.	Hall & Pritchard.
Werrikooian	—	{ Pleistocene (Tate) Pliocene (Dennant)	Pliocene
Kalimnan	Older Pliocene		Miocene
Balcombian	Oligocene	Eocene	Eocene
Jan Jucian	Miocene to Oligocene	Oligocene (?) (Tate)	Eocene
		Eocene	
Aldingan	—	Eocene (in part)	Eocene (in part)

We thus have not only differences of opinion as to the ages of the beds but also as to the sequence of the component formations.

To put the matter in another way, the sequence according to the various authors would be—in descending order.

M'Coy.	Tate & Dennant.	Hall & Pritchard.
—	Werrikooian	Werrikooian
Kalimnan	Kalimnan	Kalimnan
Jan Jucian	Jan Jucian	Balcombian
Balcombian	Balcombian	{ Jan Jucian and Aldingan (in part)
	Aldingan (in part)	